MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

SUPPLEMENTARY EXAMINATION

TRIMESTER 1, 2015/2016

PPC0116 – PRE-CALCULUS

(All Sections / Groups)

18 NOVEMBER 2015
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This examination paper consists of **5 pages** (including the cover page) with 4 **questions only**.

2. Each question is worth **25 marks. Attempt ALL questions.**

3. Please write all your answers in the Answer Booklet provided. **Show all relevant steps** to obtain maximum marks.

Question 1 (25 marks)

(a) Solve the following equation:

$$\frac{5}{x+4} = \frac{3}{x-2} + 4$$

[5 marks]

(b) Without solving, determine the character of the solutions for each of the question below.

i. $8x^2 - 11x + 5 = 0$

[2 marks]

ii. $9y^2 + 12y + 4 = 0$

[2 marks]

(c) Find the real solution of the equation $\sqrt{3x-5} - \sqrt{x+7} = 2$. Check your answer and identify the extraneous solution (if any).

[7 marks]

(d) For each of the following, solve the inequalities.

i. $(x-2)(x+2) > (x-1)(x+3)$

[3 marks]

ii. $|2y+5| \leq 7$

[2 marks]

iii. $3\left|\frac{u+3}{2}\right| - 2 \geq 4$

[4 marks]

Continued...

Question 2 (25 marks)

(a) Graph the following piecewise-defined function. State any discontinuities present in the graph.

$$f(x) = \begin{cases} |x| & if\ -2 \le x < 0 \\ x^3 & if\ x > 0 \end{cases}$$

[5 marks]

(b) For the polynomial function $f(x) = (x+1)^2(x-2)^2$

i. Find its x- and y-intercepts. [2 marks]

ii. At each x-intercept, determine whether the graph crosses or touches the x-axis. [2 marks]

iii. Determine the behavior of the graph near each x-intercept. [2 marks]

iv. Find the power function that the graph resembles for large values of $|x|$ (end behavior). [2 marks]

v. Sketch the graph of $f(x)$ and label all relevant points. [3 marks]

(c) Figure Q2 shows the exponential graph of $y = e^x$. Use the graph transformation technique to sketch the function $f(x) = 9 - 3e^{-x}$. Show all the transformation steps, and clearly label the x-intercept, y-intercept and horizontal asymptote.

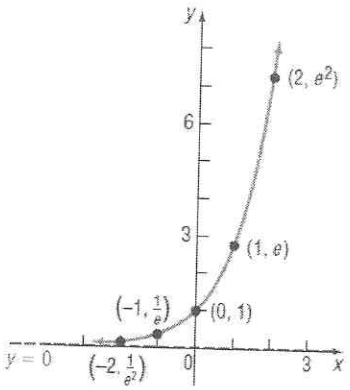

Figure Q2

[9 marks]

Continued...

Question 3 (25 marks)

(a) If $f(x) = x^4 + mx^3 + 12x^2$ is divided by $x + 1$ and the remainder obtained from the division is 5, find the value of m.

[4 marks]

(b) Use the Factor Theorem to determine whether $x - 3$ is a factor of $f(x) = x^4 - 5x^2 - 36$. Subsequently, verify your answer using synthetic division.

[6 marks]

(c) Find the partial fraction decomposition of $\frac{x^2+14}{(x^2+1)(2x+3)}$.

[10 marks]

(d) Use long division method to find the quotient and remainder for the following polynomial division:

$$5x^3 - 7x^2 + 7x - 8 \text{ divided by } 5x - 2$$

[5 marks]

Continued...

Question 4 (25 marks)

(a) The following sequence is defined recursively:

$$a_1 = 2,\ a_2 = 5;\ a_n = a_{n-2} - 3a_{n-1}$$

Find the 5th term a_5 of the sequence.

[5 marks]

(b) Given the following geometric sequence

3, -9, 27, -81, ...

i. Find the 11th term of the sequence.

[3 marks]

ii. What is the sum of the first 8 terms of the sequence?

[3 marks]

(c) Suppose Alice just received a job offer with a starting salary of RM 20,000 per year and a guaranteed raise of RM 1,200 per year.

i. Calculate Alice's salary in the n^{th} year.

[3 marks]

ii. How many years will it be before Alice has made a total (or aggregate) salary of RM 138,000?

[6 marks]

(d) Find the coefficient of x^8 in the expansion of $(x^2 - 2)^7$.

[5 marks]

End of Paper